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IS A 3D SPECKLE TRACKING ALGORITHM SYNONYMOUS WITH BETTER ESTIMATION OF LEFT VENTRICULAR FUNCTION?

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Background: Current endocardial tracking by 3D Echo has limitations. Our hypothesis is that 3D speckle tracking (LVA-3, Tomtec Imaging Systems) should be optimized differently to obtain either accurate volumes and ejection fraction (EF) or volumes, EF and longitudinal strain.

Methods: 25 subjects referred for Cardiac MRI (CMR) study underwent Cardiac CT (CCT) , 2D Echo, and 3DE imaging on the same day. 3DE images were analyzed twice using LVA-3, once by placing the borders on the inner endocardium (Strain optimization) and secondly by excluding trabeculations (Volume optimization). Agreement between 3DE and CMR according to LV End-diastolic Volumes (EDV), End systolic volumes (ESV), and EF, as well as Intra-Observer variability, were assessed. Global longitudinal strain (GLS) of 17 segments was compared.

Results: Using volume optimization, ESV was not different (p 0.23), while EDV was underestimated (p 0.02) in 3DE compared to MRI (Table). Consequently, EF was significantly underestimated ($p < 0.001$). When optimized for Strain, EDV and ESV were underestimated ($p < 0.001$ and $p=0.02$, respectively) while EF was not significantly different (p 0.06). GLS was significantly lower in volume optimized analysis as compared to strain optimized analysis (-11.7 ± 4.9 vs -12.9 ± 5.1, $p=0.001$)

Conclusions: LVA-3 provides different values when image analysis is optimized for LV volumes or Strain. 3D speckle tracking provides accurate estimation of volumes and EF, in addition to GLS when optimized for strain analysis.

Table						
EF/Strain Optimization						
	Volume		EF	R2 (Variation Coefficients, in %)		
	End-Diast.	End-Syst.		End-Diast.	End-Syst.	EF
Cardiac MRI	217 ± 114	131 ± 105	46 ± 18			
Cardiac-CT	214 ± 112	126 ± 92	47 ± 16	0.94 (6)	0.93 (9)	0.93 (7)
2D-Echo	133 ± 75	74 ± 62	51 ± 19	0.9 (35)	0.94 (41)	0.86 (11)
3D-Echo	170 ± 80	108 ± 73	42 ± 15	0.88 (18)	0.9 (17)	0.86 (11)
3D-Echo Intra-Ob				0.99 (1)	0.98 (3)	0.99 (3)
Volume Optimization						
	Volume		EF	R2 (Variation Coefficients, in %)		
	End-Diast.	End-Syst.		End-Diast.	End-Syst.	EF
Cardiac MRI	188 ± 86	101 ± 72	50 ± 15			
Cardiac-CT	186 ± 93	101 ± 72	50 ± 14	0.93 (7)	0.92 (9)	0.93 (6)
2D-Echo	116 ± 64	57 ± 45	55 ± 16	0.9 (35)	0.91 (42)	0.83 (10)
3D-Echo	171 ± 74	108 ± 60	40 ± 13	0.85 (11)	0.83 (19)	0.67 (17)
3D-Echo Intra-Ob				0.99 (1)	0.99 (1)	0.98 (2)